



SB 1086

**SACRAMENTO RIVER
CONSERVATION AREA FORUM
HANDBOOK**

SEPTEMBER 2003

*Prepared for The Resources Agency
State of California
by the Sacramento River Advisory Council
under the SB 1086 Program*

Sacramento River Conservation Area Forum Handbook

2003

*Prepared for The Resources Agency
State of California
by the Sacramento River Advisory Council
under Senate Bill 1086
authored by Senator Jim Nielsen*

Revised and updated by the
Sacramento River Conservation Area Forum
September 2003

Cover photo: Looking west over Murphy Slough near the M&T flood relief structure. By Geoffrey Fricker

Dedicated to Bob Bosworth, who has grown up and worked along the Sacramento River his entire life. Bob is a strong advocate of balancing the needs of agriculture and wildlife habitat for the benefit of future generations.

This Handbook is a “living document.” As conditions change and our understanding of the river system increases, periodic updates may be made. Substantive changes will be made following an established amendment procedure. If you have comments, corrections, or suggestions, please contact:

**Sacramento River Conservation Area Forum
2440 Main Street
Red Bluff, CA 96080
(530) 528-7411**

To view the most current version of the Handbook, please log on our website at: www.sacramentoriver.ca.gov.

Sacramento River Conservation Area Forum

Board of Directors

2003

Jane Dolan, Chair

Don Anderson, Vice Chair—Dan Silva, Secretary/Treasurer

Burt Bundy, Manager

Butte County

Jane Dolan Shirley Lewis

Resources Agency

Mel Dodgin

Colusa County

David Womble Ben Carter

California Dept of Fish and Game

Diana Jacobs*

Glenn County

Denny Bungarz Don Anderson

California Dept of Water Resources

Dwight Russell*

Shasta County

Glenn Hawes Dan Gover

State Reclamation Board

Pete Rabbon*

Sutter County

Dan Silva Russell Young

US Army Corps of Engineers

Mark Charlton*

Tehama County

Bill Borror Brendon Flynn

US Bureau of Reclamation

Frank Michny*

Yolo County

Lynnel Pollock Marc Faye

US Fish & Wildlife Service

Darrin Thome*

*Ex-officio

Foreword

Passed by the State Legislature in 1986, Senate Bill 1086 called for a management plan for the Sacramento River and its tributaries that would protect, restore, and enhance both fisheries and riparian habitat. The law established an Advisory Council, composed of representatives of state and federal agencies, county supervisors, and representatives of landowner, water contractor, commercial and sport fisheries, and general wildlife and conservation interests.

After more than 50 lengthy meetings and workshops, the Council and its action teams developed a plan which included a specific and action-oriented fisheries plan and a more conceptual riparian habitat plan. This plan, the Upper Sacramento River Fisheries and Riparian Habitat Management Plan (1989 Plan), was published in 1989. Many of the fisheries action items have since been, or are currently being, implemented, such as fish bypass structures at diversions on Sacramento River tributaries and the Shasta Dam temperature control structure.

The Riparian Habitat Committee of the Advisory Council, an informal and consensus-based planning group that included landowner representatives, environmental group leaders, and agency personnel, continued the work of on-the-ground implementation. The Advisory Council was reconvened by the Secretary of Resources in 1993 to “complete its earlier work concerning riparian habitat protection and management, including the development of a specific implementation program.”

The committee developed this Handbook to guide an implementation program for riparian habitat management along the Sacramento River, and worked to ensure that this Handbook addresses both the dynamics of riparian ecosystems as well as the realities of local agricultural issues. It did this by developing a set of guiding principles and planning tools that should govern riparian habitat management along the river.

The six principles fall into the categories of:

- *Ecosystem management
- *Local concerns
- *Flood management
- *Bank protection
- *Voluntary participation
- *Information and education

A Memorandum of Agreement between local, state, and federal agencies has been signed by most of the key agencies and all of the named counties that formally adopts the Handbook and commits support for the formation of a locally based nonprofit organization to coordinate activities along the river. In May 2000, the Sacramento River Conservation Area (SRCA), a nonprofit, public benefit corporation was formed. The SRCA is governed by a Board of Directors that includes both private landowner and public interest representatives from each of the seven involved counties, an appointee of the Resources Agency, as well as ex-officio members from six state and federal resource agencies. A Technical Advisory Committee (TAC), composed of experts from relevant disciplines, as well as landowners, has been established to advise the SRCA Board on issues related to river management and site-specific planning. Committee members include agency and academic scientists as well as stakeholders. Much of the work of the organization focuses along an area within the *inner river zone guideline*, where flooding and channel movement are present, primarily between Red Bluff and Colusa. Whether a particular parcel or property is within the inner river zone will be determined on a case-by-case basis, using voluntary participation, erosion and accretion projections, and flood frequency as criteria. If all landowners within the potential inner river zone choose to participate, the area could include about 50,000 acres between Red Bluff and Colusa.

The MOA, Handbook, and Sacramento River Conservation Area represent a new type of sustainable river corridor management in which all stakeholders, including local, state, and federal agencies, public interest groups and landowners are closely involved in the planning and decision making process and implementation of river related activities. Restoration efforts, as well as flood control, water supply and other activities, benefit from the open dialogue fostered through the forum provided by the Sacramento River Conservation Area planning process.

The descriptive and scientific portions of this Handbook (Chapters 2–6) are based upon current knowledge. As our understanding of the Sacramento River system improves over time, these chapters are periodically amended. Similarly, the portions of the Handbook (Chapters 1, 7, 8 and 9) dealing with institutions and policies also become outdated as circumstances change. Therefore, the SRCA Board will, from time to time, adopt revisions to this Handbook. In 2001, the SRCA Board addressed two areas of concern in the Handbook that were not completed prior to the printing of the Handbook, and were listed in the “Issues to be Resolved” section. Through the TAC, and with help from an ad hoc committee that had worked on these issues under the Riparian Habitat Committee, recommendations to formally adopt acceptable language were agreed with and forwarded to the SRCA Board. The Board also worked through the TAC to define the Inner River Zone Guidelines for Reaches 1, 3, and 4 that had not been defined in the January 2000 edition.

In 2002, the Board amended the Handbook to re-define the outer boundary of the Conservation Area. Below Tehama County, the outer boundary is the same as defined for the Inner River Zone Guidelines. The Board also made it clear that any related activity outside of the IRZ would be addressed by the SRCA. In 2003, an amendment was adopted that revised language in a section of Chapter 6. All of the changes to text and acreages as a result of the amendments have been incorporated in the 2003 edition of the Handbook. Although not a Handbook change, but noteworthy, was direction from the Board to change its name to the Sacramento River Conservation Area *Forum*. Members of the Board felt that by adding “*Forum*” to the name, it better described the role of the organization. Chapter 1 describes the guiding principles and planning tools that the SRCAF organization uses. Chapter 2 describes the Sacramento River ecosystem and how it relates to riparian habitat.

This chapter also includes a complete description of the inner river zone guidelines. Chapters 3 through 6 discuss the river ecosystem in more detail within the four broad river reaches of the Conservation Area. The restoration priorities and inner river zone guidelines are then applied to each reach. Chapter 7 describes existing riparian habitat management programs along the river. Chapter 8 describes those government agencies and private organizations that the nonprofit management entity works with most closely in conducting riparian habitat management activities. Chapter 9 describes the recommended actions to be carried out on the ground. A series of appendices on topics useful to the nonprofit management entity is also included.

The SB1086 Advisory Council - 2002

Denny Bungarz, Glenn County Supervisor, Chair
Bob Bosworth, Past Chair

Dan Silva, Sutter County
vacant, California Water Commission
Bill Borrer, Tehama County
Brendon Flynn, Sacramento Valley Landowners Association
James Fenwood, U. S. Forest Service
Robert D. Clark, Sac River Water Contractors Association
Diana Jacobs, Department of Fish and Game
Mel Dodgin, Commercial fishing representative
Jane Dolan, Butte County
Denny Bungarz, Glenn County
Dwight Russell, Department of Water Resources
Jim Bybee, National Marine Fisheries Service
Gerald Johns, State Water Resources Control Board
David McNamara, Department of Forestry and Fire Protection
Michael Thabault, U. S. Fish and Wildlife Service
Charlie Moss, General Wildlife and Conservation Rep.
Mark Charlton, U.S. Army Corps of Engineers
Pete Rabbon, The Reclamation Board
Steve Shaffer, California Department of Food and Agriculture
Mike Ryan, Bureau of Reclamation
Dwight Sanders, State Lands Commission
Al Wright, Wildlife Conservation Board
Chuck Schultz, Bureau of Land Management
William Waite, Colusa County
Glenn Hawes, Shasta County
Hank Wyman, Natural Resources Conservation Service
Lynnel Pollock, Yolo County

Riparian Habitat Committee 1993-1999

Diana Jacobs, Chair

The Riparian Habitat Committee is an informal group. The following individuals have attended meetings, participated in discussions, and contributed to this handbook:

Ken Anderson, California Department of Fish and Game
Mike Bonner, U.S. Army Corps of Engineers
Bill Borrer, Tehama County Board of Supervisors
Bob Bosworth, SB1086 Advisory Council
Annalena Bronson, California Department of Water Resources
Burt Bundy, Sacramento River Conservation Area Coordinator
John Carlon, Sacramento River Partners
Stacy Cepello, California Department of Water Resources
Bob Clark, Sacramento River Water Contractors Association
Scott Clemons, Wildlife Conservation Board
Kristin Cooper-Carter, University Foundation
Earle Cummings, California Department of Water Resources
Dave Cox, California Department of Parks and Recreation
Julie Cunningham, California Department of Water Resources
Kim Davis, Representing Senator Maurice Johannessen
Matt Davis, U.S. Army Corps of Engineers
Chuck DeJournette, Tehama Fly Fishers
Rich Dixon, California Department of Fish and Game
Rick Dreher, U.S. Army Corps of Engineers
Gary Falxa, U.S. Fish and Wildlife Service
Rebecca Fawver, The Resources Agency
Brendon Flynn, Pacific Farms
Wendell Gilgert, Natural Resources Conservation Service
Tom Griggs, California State University, Chico
Kate Hansel, CALFED-Bay Delta Program
Diane Hanson, U.S. Bureau of Reclamation
Les Heringer, M&T Ranch
Flynn Hoffman, Representing Congressman Vic Fazio
John Icanberry, U.S. Fish and Wildlife Service
Dan Keppen, Northern California Water Association
Patrick Koepele, U.S. Army Corps of Engineers
Joyce Lacey-Rickert, California Department of Water Resources
Jason Larrabee, Larabee Farms
Sam Lawson, The Nature Conservancy
Mike Matthews, EA Engineering
John Merz, Sacramento River Preservation Trust
Marlyce Myers, The Nature Conservancy
Ernie Ohlin, Tehama County
John Repanich, Sacramento Valley Landowners Association/Landowner representative appointed by the California Department of Food and Agriculture
Pat Repanich, Sacramento Valley Landowners Association

Fraser Sime, California Department of Water Resources
Rita Singer, California Department of Water Resources
John Siperek, California Department of Fish and Game
Jim Snowden, California Department of Fish and Game
Marie Sullivan, U.S. Fish and Wildlife Service
Audrey Tennis
Tanis Toland, U.S. Army Corps of Engineers
Ramon Vega, U.S. Fish and Wildlife Service
William Waite, Colusa County Board of Supervisors
Paul Ward, California Department of Fish and Game

Technical Advisory Committee

2002 Chair—Anjanette Martin

Vice-Chair—Stacy Cepello

The Technical Advisory Committee, composed of scientists from relevant disciplines, has been established to advise the SRCA on issues related to river management and site specific planning. Team members include agency and academic scientists as well as private individuals. Representatives from the following agencies and/or organizations have attended the TAC meetings:

California Department of Fish and Game
U.S. Army Corps of Engineers
Department of Water Resources
Sacramento River Partners
Sacramento River Water Contractors
National Marine Fisheries Service
Wildlife Conservation Board
Department of Parks and Recreation
U.S. Fish and Wildlife Service
State Reclamation Board
CALFED Bay-Delta Program
U.S. Bureau of Reclamation
Bureau of Land Management
Northern California Water Association
The Nature Conservancy
Sacramento River Preservation Trust
Senator Maurice Johannessen
Family Water Alliance
California Farm Bureau Fed.
RD 1001
RD 108
Nor-Cal Guides Association

California Resources Agency
Assemblyman Dick Dickerson
Congressman Doug Ose
Trust for Public Land
Butte County Farm Bureau
UC Cooperative Extension
RD 1500
Colusa County Farm Bureau
Sacramento River Reclamation Dist.
Sacramento Valley Landowners Association
Hamilton City Community Services Dist
Natural Resources Conservation Service
Assemblyman Sam Aanestad
Princeton-Codora-Glenn Irrigation District
Butte County
Colusa County
Glenn County
Shasta County
Sutter County
Tehama County
Yolo County
Glenn-Colusa Irrigation Dist.

Acknowledgments

The first edition of the Handbook was prepared by the following individuals at the California Department of Water Resources, Northern District, under the direction of the SB1086 Riparian Habitat Committee:

Stacy Cepello
Julie Cunningham
Joyce Lacey

Additional support was provided by the following individuals at the California Department of Water Resources:

Curtis Anderson
Dave Bogener
Koll Buer
Toni Cardenas
Lorry Divine
Mark Dombrowski
Tanya Ehorn
Alison Groom
Eric Haney
Heather Harmon
Ralph Hinton
Matt Kelly
Lori Miles
Tara Morgan
Jared Ramey
Lora Richards
Rodney Sparks
Stan Taylor
and the Graphic Services Branch

The Riparian Habitat Committee thanks the following individuals and organizations for providing information or illustrations for this Handbook:

Steve Arrison, California Department of Fish and Game
George Basye, Downey, Brand, Seymour and Rohwer
John Benoit, Glenn County Resource, Planning and Development Department
Francis Berg, U.S. Bureau of Land Management
Dean Burkett, National Resources Conservation Services
California Native Plant Society
Jim Coates, City of Redding Public Works Department
Val Connor, U.S. Environmental Protection Agency
Sherry Cooper, UC Cooperative Extension
Dave Cox, California Department of Parks and Recreation
Narca Moore Craig
Sally Davis, California Exotic Plant Pest Council
Woody Elliott, California Department of Parks and Recreation
Gary Falxa, U.S. Fish and Wildlife Service

Geoffrey Fricker, Butte College
Molly Fuller, U.S. Forest Service
Tom Griggs, The Nature Conservancy
Todd Hillaire, California Department of Water Resources
Brad Hubbard, U.S. Army Corps of Engineers
Jean Hubbel, California State University, Chico
Dan Keppen, Tehama County Public Works Department
Cathy Klinestecker, Sacramento River Discovery Center
Bill Lawhorn, U.S. Bureau of Land Management
Kent Manuel, City of Redding Planning Department
Eric McGuire, U.S. Bureau of Reclamation
David Morrison, Yolo County Planning Department
Joe Molter, U.S. Bureau of Land Management
Bud Pahl, U.S. Army Corps of Engineers
Daryl Peterson, The Nature Conservancy
Mike Peterson, California Department of Water Resources
Katie Pye, Yolo County Resource Conservation District
George Robson, Tehama County Planning Department
Penny Ruvelas, National Marine Fisheries Service
Ron Schlorff, California Department of Fish and Game
Joe Silveira, U.S. Fish and Wildlife Service
Megan Standard, California Department of Boating and Waterways
Tehama County Public Library
Mike Truden, U.S. Bureau of Land Management
Wayne White, U.S. Fish and Wildlife Service
Dale L. Whitmore, California Department of Fish and Game
Dave Woods, California State University, Chico

2001-2003 Revisions

The Sacramento River Conservation Area Board acknowledges the following SRCAF and DWR personnel for their contributions to the 2001-2003 Handbook revisions:

Pat Brown
Burt Bundy
Stacy Cepello
Alison Groom
Kelly Allen
John Lance
Adam Henderson
Nikki Blomquist

Contents

FOREWORD	III
MEMBER LIST: SB1086 ADVISORY COUNCIL	IV
MEMBER LIST: RIPARIAN HABITAT COMMITTEE.....	VI
MEMBER LIST: TECHNICAL ADVISORY COMMITTEE	VIII
ACKNOWLEDGEMENTS.....	IX
 CHAPTER 1. BASIC PRINCIPLES AND MANAGEMENT GUIDELINES.....	 1-1
BASIC PRINCIPLES	1-2
MANAGEMENT GUIDELINES.....	1-6
 CHAPTER 2. THE RIPARIAN FORESTS OF THE SACRAMENTO RIVER ECOSYSTEM .	 2-1
HISTORICAL EXTENT OF RIPARIAN FORESTS	2-1
THE PHYSICAL ENVIRONMENT	2-2
Channel Movement and River Meander	2-2
Geology.....	2-4
Sediment Transport.....	2-4
Hydrology and Flooding.....	2-6
THE BIOLOGICAL ENVIRONMENT.....	2-7
The Ecological Adaptations of Riparian Plants	2-7
The Changing Mosaic of Successional Stages.....	2-9
Habitat Types at the Water’s Edge	2-15
Riparian Habitat and Wildlife.....	2-17
Fragmentation of Habitat	2-19
Sensitive Wildlife Species	2-20
RIPARIAN FOREST SUCCESSION AND AN INNER RIVER ZONE GUIDELINE	2-20
THE SACRAMENTO RIVER FLOOD CONTROL PROJECT	2-24
Sacramento River Bank Protection Project.....	2-25
 CHAPTER 3. KESWICK DAM–RED BLUFF REACH.....	 3-1
PHYSICAL SETTING.....	3-2
Geology and Soils.....	3-2
Historical Channel Movement	3-5
Sediment Transport.....	3-5
Hydrology and Tributaries.....	3-5

Land Use	3-6
RIPARIAN VEGETATION.....	3-6
Current Acreage	3-6
Ownership	3-8
Restoration Strategy	3-9
Inner River Zone Guideline	3-9
 CHAPTER 4. RED BLUFF–CHICO LANDING REACH	 4-1
PHYSICAL SETTING.....	4-4
Geology and Soils	4-4
Sediment Transport.....	4-6
Hydrology and Tributaries	4-6
Land Use	4-7
RIPARIAN VEGETATION.....	4-8
Current Acreage	4-8
Current Extent of Habitat Types at Water’s Edge.....	4-10
Bank Swallow Nesting Habitat	4-10
Shaded Riverine Aquatic Habitat.....	4-10
Ownership	4-10
Restoration Strategy	4-11
Inner River Zone Guideline	4-11
 CHAPTER 5. CHICO LANDING–COLUSA REACH	 5-1
PHYSICAL SETTING.....	5-4
Geology and Soils	5-4
The Sacramento River Flood Control Project.....	5-4
Channel Movement	5-5
Land Use	5-5
RIPARIAN VEGETATION.....	5-6
Current Acreage	5-6
Current Extent of Habitat Types at the Water’s Edge.....	5-8
Bank Swallow Nesting Habitat	5-8
Shaded Riverine Aquatic Habitat.....	5-8
Ownership	5-8
Restoration Strategy	5-9
Inner River Zone Guideline	5-9

CHAPTER 6. COLUSA-VERONA REACH.....	6-1
PHYSICAL SETTING.....	6-2
Soils	6-2
Historical Channel Movement	6-4
Flood Control and Reclamation	6-4
Land Use.....	6-5
RIPARIAN VEGETATION.....	6-6
Current Acreage.....	6-6
Ownership.....	6-7
Restoration Strategy.....	6-9
Inner River Zone Guideline	6-10
 CHAPTER 7. CURRENT CONSERVATION AND MANAGEMENT OF RIPARIAN HABITAT ALONG THE SACRAMENTO RIVER.....	 7-1
CONSERVATION PROGRAMS.....	7-1
CALFED Bay-Delta Program.....	7-1
Sacramento River Project (The Nature Conservancy)	7-1
Acquisition and Restoration.....	7-2
Sustainable Farming	7-2
Kopta Slough Partnership	7-2
Phase I Mitigation Partnership.....	7-2
Llano Seco Ranch Partnership	7-3
U.S. Fish and Wildlife Service Partnership	7-3
The Sacramento River National Wildlife Refuge (U.S. Fish and Wildlife Service).....	7-3
The Sacramento River Wildlife Area and Other Properties (California Department of Fish and Game)	7-4
Riparian Restoration-Agricultural Operations Program.....	7-4
Other Parcels.....	7-4
Sacramento River Area (Bureau of Land Management).....	7-5
State Parks (California Department of Parks and Recreation)	7-6
Other Holdings (Various Agencies).....	7-6
MITIGATION PROGRAMS.....	7-6
Land and Easements—Sacramento River Bank Protection Project Mitigation (U.S. Army Corps of Engineers, California Department of Water Resources)	7-6
Evaluation of Mitigation Measures.....	7-7
FLOOD MANAGEMENT PROGRAMS.....	7-7
Murray, Burns, and Kienlen Sites (The Reclamation Board)	7-7

Designated and Regulatory Floodways (The Reclamation Board and the National Flood Insurance Program)	7-8
The Sacramento and San Joaquin Rivers Basins Comprehensive Study	7-8

CHAPTER 8. RIPARIAN HABITAT ALONG THE SACRAMENTO RIVER: LOCAL, STATE, AND FEDERAL AGENCIES AND PRIVATE ORGANIZATIONS 8-1

LOCAL AGENCIES	8-1
Counties and Cities	8-2
STATE AGENCIES	8-17
Office of the Secretary for Resources	8-17
California Department of Fish and Game	8-17
Fish and Game Commission	8-20
Wildlife Conservation Board	9-21
Department of Water Resources	8-22
Reclamation Board.....	8-23
Department of Parks and Recreation.....	8-24
Department of Boating and Waterways	8-25
California Water Commission.....	8-25
Office of Emergency Services	8-26
Department of Forestry and Fire Protection.....	8-26
Regional Water Quality Control Board.....	8-27
State Lands Commission.....	8-28
FEDERAL AGENCIES	8-29
United States Fish and Wildlife Service	8-29
United States Bureau of Reclamation	8-31
United States Bureau of Land Management	8-32
United States Geologic Survey	8-33
United States Army Corps of Engineers	8-33
United States Natural Resource Conservation Service	8-35
United States Forest Service	8-36
National Marine Fisheries Service	8-37
United States Environmental Protection Agency	8-37
Federal Emergency Management Agency	8-38
PRIVATE ORGANIZATIONS.....	8-39
California Central Valley Flood Control Association.....	8-39
Sacramento River Discovery Center.....	8-40

Sacramento River Preservation Trust	8-40
Sacramento Valley Landowners Association.....	8-40
CHAPTER 9. RECOMMENDED ACTIONS	9-1
FORM A LOCALLY-BASED NONPROFIT MANAGEMENT ORGANIZATION	9-2
OBTAIN A SIGNED MEMORANDUM OF AGREEMENT BETWEEN THE APPROPRIATE AGENCIES ...	9-2
DEVELOP SITE-SPECIFIC PLANS AND CONTRACTS	9-2
CONSERVATION EASEMENTS	9-4
SET-ASIDE AGREEMENTS	9-4
BANK PROTECTION	9-6
ACQUISITION.....	9-6
FLOODPLAIN MANAGEMENT.....	9-7
OTHER ACTIONS	9-7
DEVELOP REGULATORY CONSISTENCY/STREAMLINING PROGRAM	9-7
DEVELOP MUTUAL ASSISTANCE PROGRAM.....	9-9
DEVELOP EDUCATION AND OUTREACH PROGRAM	9-9
SUPPORT MONITORING AND RESEARCH PROGRAMS.....	9-11
 APPENDIX A. SENSITIVE PLANTS IN THE SACRAMENTO RIVER	
CONSERVATION AREA	A-1
 APPENDIX B. WILDLIFE SPECIES IN THE SACRAMENTO RIVER	
CONSERVATION AREA.....	B-1
 APPENDIX C. SACRAMENTO RIVER GEOGRAPHIC INFORMATION SYSTEM	C-1
 APPENDIX D. SUMMARY OF ACREAGE TABULATIONS.....	D-1
 APPENDIX E. SENATE BILL 1086 AND SENATE CONCURRENT RESOLUTION NO. 62	E-1
 APPENDIX F. REPORT ON COSTS	F-1
 APPENDIX G. HANDBOOK AMENDMENT PROCEDURE	G-1
 APPENDIX H. GLOSSARY	H-1
 APPENDIX I, “ISSUES TO BE RESOLVED,” HAS BEEN DELETED FROM THE 2002	
HANDBOOK.	I-1

APPENDIX J. MEMORANDUM OF AGREEMENT	J-1
--	------------

APPENDIX R. REFERENCES.....	R-1
------------------------------------	------------

Figures

Figure 1-1. The Structure of the SB1086 Program.....	1-3
--	-----

Figure 2-1. The Four Reaches of the Sacramento River Conservation Area.....	2-29
---	------

Figure 2-2. Typical bend on a meandering river.	2-3
--	-----

Figure 2-3. Sacramento River channel at River Mile 183, south of Ord Ferry Bridge, in 1896, 1908, and 1991. Chute cutoff prior to 1908 resulted in formation of “The Lagoon”, an oxbow lake. Notice development of a new meander bend in the 1991 alignment..	2-4
--	-----

Figure 2-4. Typical cross-sections of the four reaches	2-5
--	-----

Figure 2-5. Typical plant communities and successional stages on the Sacramento River	2-31
---	------

Figure 2-6 Willow scrub, Sacramento River	2-10
---	------

Figure 2-7. Great Valley cottonwood riparian forest, Sacramento River	2-12
---	------

Figure 2-8. Valley oak woodland, Sacramento River.....	2-13
--	------

Figure 2-9. Giant reed (<i>Arundo donax</i>)	2-15
--	------

Figure 2-10. Shaded Riverine Aquatic Habitat along the Sacramento River.	2-16
---	------

Figure 2-11. Cut bank with bank swallow burrows, Sacramento River, Chico Landing-Red Bluff Reach.....	2-16
---	------

Figure 2-12. Slough along the Sacramento River.....	2-17
---	------

Figure 2-13. The 100-year meanderbelt is combined with 50-year erosion projections developed by U.S. Army Corps of Engineers (Projection A) and California Department of Water Resources (Projection B).	2-22
---	------

Figure 2-14. Sacramento Valley Flood Control System.....	2-33
--	------

Figure 3-1. Sacramento River Conservation Area, Keswick Dam to Red Bluff	3-3
--	-----

Figure 3-2. Portions of the Keswick–Red Bluff Reach showing the most channel movement since 1860. Acreage denotes approximate land surface area of these meandering subreaches.	3-4
--	-----

Figure 3-3. Narrow corridor of riparian vegetation bordered by native upland vegetation	3-7
---	-----

Figure 3-4. Sacramento River near Bend (RM 257-273) showing area inundated by a 2.5-year recurrence interval flood.....	3-8
---	-----

Figure 4-1. Sacramento River Conservation Area, Red Bluff to Chico Landing	4-3
--	-----

Figure 4-2. Generalized geologic units and infrastructure (bridges, water diversions, and urban and industrial land uses) along the Sacramento River, RM 214-227(Vina Quad)	4-4
Figure 4-3. Sacramento River corridor near Tehama. Much of the Conservation Area contains productive agricultural areas.	4-5
Figure 4-4a. A comparison of land use patterns between an active subreach (left) and a more stable subreach (right). Dark brown areas represent orchards.	4-9
Figure 4-4b. A comparison of riparian vegetation patterns between an active sub-reach (left) and a more stable subreach (right). Green areas represent successional stages of riparian forest.....	4-9
Figure 4-6. Comparison of inner river zone guideline with area inundated in a 2.5-year flood.	4-12

Figure 5-1. Sacramento River Conservation Area, Chico Landing to Colusa	5-3
Figure 5-2. Murphy Slough	5-7
Figure 5-3. Areas inundated at various flood recurrence intervals within the Sacramento River Flood Control Project setback levees.....	5-10

Figure 6-1. Sacramento River Conservation Area, Colusa to Verona Reach	6-3
Figure 6-2. Narrow “stringer” of riparian vegetation, Colusa–Verona Reach.....	6-7
Figure 6-3. Riparian vegetation near Moon’s Bend (RM 138).....	6-8
Figure 6-4. Riparian vegetation on waterside berm, downstream of Colusa Bridge	6-8
Figure 6-5. Area with little riparian vegetation, Colusa–Verona Reach.....	6-9

Figure 9-1. Site-specific management planning.	9-3
---	-----

Tables

Table 2-1. Common Sacramento River riparian forest species.	2-8
Table 2-2. Typical habitats of the Sacramento River system and examples of wildlife using these habitats.	2-10
Table 2-3. Exotic plant species within the Sacramento River riparian area.	2-14

Table 3-1. Features of the Keswick—Red Bluff Reach	3-2
Table 3-2. Land use, Keswick-Red Bluff Reach	3-6
Table 3-3. Riparian and closely related habitats within the Conservation Area, Keswick–Red Bluff Reach.....	3-7
Table 3-4. Land ownership within the Conservation Area, Keswick-Red Bluff Reach	3-9

Table 4-1. Features of the Red Bluff–Chico Landing Reach.....	4-2
Table 4-2. Geomorphic subreaches of the Sacramento River between Red Bluff and Chico Landing	4-6
Table 4-3. Land Use within the Conservation Area, Red Bluff–Chico Landing Reach.....	4-8
Table 4-4. Riparian and closely related habitats within the inner river zone guideline, Red Bluff– Chico Landing Reach	4-10
Table 4-5. Ownership, Red Bluff–Chico Landing Reach.....	4-11
Table 4-6. Comparison of areas within the inner river zone guideline, area inundated in a 2.5-year flood, and Conservation Area, Red Bluff to Chico Landing Reach	4-12

Table 5-1. Features of the Chico Landing–Colusa Reach	5-2
Table 5-2. Land use within the Conservation Area, Chico Landing–Colusa Reach.....	5-6
Table 5-3. Riparian and other native vegetation types and closely related classifications within the Conservation Area	5-7
Table 5-4. Ownership within the Conservation Area, Chico Landing–Colusa Reach.....	5-9

Table 6-1. Features of the Colusa–Verona Reach	6-2
Table 6-2. Land Use within the Conservation Area, Colusa–Verona Reach.....	6-5
Table 6-3. Public and Private River Access Spots, Colusa–Verona Reach.....	6-6
Table 6-4. Riparian and closely related vegetation within the Conservation Area.....	6-7
Table 6-5. Land ownership within the Conservation Area, Colusa–Verona Reach	6-9
Table 6-6. Significant areas of native vegetation and potential “natural restoration” areas between levees.....	6-11

Table 8-1. Local jurisdictions within the Sacramento River Conservation Area	8-2
--	-----